# Simulation study of L/H transition with self-consistent integrated modelling of core and SOL/divertor transport

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Control of the power and particle exhaust is one of the most critical issues to achieve the fusion reactors, such as ITER and DEMO. To investigate the control method by the divertor, we have developed a 2D divertor code, SONIC [1]. The SONIC suite of integrated divertor codes consists of the 2D plasma fluid code (SOLDOR), the neutral Monte-Carlo code (NEUT2D) and the impurity Monte-Carlo code (IMPMC). In order to investigate the interactions between core and SOL/divertor transport, SONIC has been consistently coupled to a 1.5 D tokamak transport code (TOPICS-IB [2]). The predictive simulation studies were carried out for JT-60SA with this integrated code [3]. Dynamic change in particle and heat fluxes into the SOL region after an H-mode transition had a significant influence on the characteristics of divertor plasma. We also investigated temporal behavior of heat load onto the divertor targets after an ELM heat crash. In these simulations, the timing of the H-mode transition and the anomalous heat diffusivities before and after the transition were specified as input data.

On the other hand, the transport model based on the current-diffusive balloning mode (CDBM) [4] could explain the change in the electron density profile before and after L/H transition in the particle transport simulation [5]. It was found that the ExB rotation shear induces the reduction in the transport during the H-mode phase, depending on the edge temperature. In the simulations, the temperature profile was assumed to be parabolic in the core and to exponentially decay in the SOL. The radial electric field in the peripheral region strongly depends on the SOL/Divertor transport through the particle source and energy loss due to the interaction with the neutrals, and the impurity radiation. We therefore carry out temporal simulations for JT-60SA L/H transition with the integrated code including the CDBM model and verify the role of the SOL/divertor transport in L/H transition.

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[1] K. Shimizu, T. Takizuka, et al., Nucl. Fusion **49** (2009) 065028.
[2] N. Hayashi, JT-60 Team, Phys. Plasmas **17** (2010) 056112.
[3] K. Shimizu, T. Takizuka, et al., 23rd IAEA Fusion Energy Conference, (Daejeon, 2010) IAEA/THD/5-2Ra.
[4] A. Fukuyama, K. Itoh, et al., Plasma Phys. Control. Fusion **37** (1995) 611.
[5] A. Fukuyama, Y.Fuji, et al., Plasma Phys. Control. Fusion **38** (1996) 1319.